

GEO Ministerial Summit

Earth Observations for Sustainable Growth and Development

Draft GEO Report on Progress

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Objectives of the Report on Progress

- Remind Ministers of their political commitments to Global Earth Observation System of Systems and that a successful implementation of its 10 Year Plan will result, particularly for developing countries, in improved resilience to the impacts of natural and human induced environmental change and variability on such political imperatives as food and water security, and the safety and health of their citizens.
- Restate that Earth Observations provide critical information to support a broad range of societal benefits for all nations, supporting the specific theme of this meeting – ***‘Earth Observation for Sustainable Growth and Development’***.
- Inform Ministers about benefits already realized through the early efforts of GEO – locally, regionally and world wide – providing high-level summary of early achievements including a more detailed Annex, highlighting examples of early achievements and vignettes submitted by Members and Participating Organizations.
- Bring to the attention of Ministers four emerging priority areas of high societal and political interest where GEOSS can contribute:
 - climate change and sustainable development
 - water security for society and the biosphere
 - healthy ecosystems and biodiversity
 - disaster prevention and mitigation
- Respond to Ministers’ call for sustainable growth and development through informed policies and decisions pertaining to human health, healthy and secure natural systems, as well as wise use of the Earth’s natural environmental resources.
- Engage the commitment Ministers for continued support of GEO by providing a logical foundation for the Declaration.



Preamble

Natural and human induced changes in the Earth's land surface, atmosphere, oceans and biosphere are having significant and increasingly severe impacts on our planet, impeding social and economic progress of all nations, especially in the developing world. Sustainable growth and development demands well-informed policies and effective decision making. This requires coordinated, comprehensive and sustained Earth observations, as the foundation of sound scientific understanding.

The Group on Earth Observations (GEO) is establishing the Global Earth Observation System of Systems (GEOSS) to enable developing and developed countries to leverage Earth observations to address the urgent challenges that are faced by an increasingly vulnerable global society.

Executive Summary

Section I: Introduction

In 2007, five years after the World Summit on Sustainable Development (WSSD), ministers are gathering once again in South Africa to take stock of the progress toward establishing the GEOSS.

The strong messages in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) and the Stern Review acknowledge that we are now in an era of significant environmental and climate change with major societal, economic and environmental consequences.

At the same time, sustainable growth and development are vital goals of all countries, especially those with developing and transitional economies. Achieving these goals is fraught with numerous challenges ranging from growing populations, expanding

GEO and GEOSS Genesis

2003 – 1st Earth Observation Summit: Adopted a declaration establishing an ad-hoc Group on Earth Observations

2004 – 2nd Earth Observation Summit: Described the scope of a Global Earth Observation System of Systems.

2005 – 3rd Earth Observation Summit: Established the Group on Earth Observations and endorsed the GEOSS 10-Year Implementation Plan.

urbanization, and increasing energy and resource demands. The effects of environmental and climate change including more frequent extreme weather events including droughts, floods, changing sea levels, and damaging storms are now a reality.

Data, information and predictions derived from a coordinated, comprehensive and sustained monitoring of the Earth's systems is essential to support informed decision making on fundamental societal issues.

GEO and Other Initiatives

At the World Summit on Sustainable Development (WSSD) in 2002, world leaders proclaimed the need “to promote the development and wider use of Earth observation technologies.” That vision built on the outcomes of landmark environmental summits, especially the 1972 Environment Summit, the 1992 Earth Summit, and the resulting Conventions on climate change and biodiversity. The WSSD and the many environmental treaties crafted over the past 30 years all have components that explicitly reference the requirement for Earth observations to fulfill their commitments.

GEOSS is substantially contributing to the United Nations Millennium Development Goals, including those mitigating poverty, hunger and disease. The need for coordinated Earth observations, and the concept of GEOSS itself, has also been consistently reinforced by G8 Summits. The G8 nations made a clear commitment to strengthen international cooperation on global Earth observations in 2003 at Evian, and reinforced this commitment through the 2005 Gleneagles Plan of Action and the 2007 Summit in Heiligendamm.

Aim of GEOSS

The goal of GEOSS is to achieve ***comprehensive, coordinated, and sustained*** observations of the Earth system to improve monitoring of the changing state of the planet, increase understanding of complex Earth processes, and enhance the prediction of the impacts of environmental change. GEOSS will meet the need for all nations to benefit from access to timely, quantitative, and high-quality long-term global data and information as a basis for sound decision making, and will enhance delivery of benefits to society in the following areas:

- ***Disasters*** - Reducing loss of life and property from natural and human-induced disasters;
- ***Human Health*** - Understanding environmental factors affecting human health and well-being;
- ***Energy Management*** - Improving management of energy resources;
- ***Climate Variability and Change*** - Understanding, assessing, predicting, mitigating, and adapting to climate variability and change;
- ***Water Cycle*** - Improving water resource management through better understanding of

- the water cycle;
- ***Weather*** - Improving weather information, forecasting, and warning;
- ***Protection of Ecosystems*** - Improving the management and protection of terrestrial, coastal, and marine resources;
- ***Agriculture*** - Supporting sustainable agriculture and combating desertification;
- ***Conserving Biodiversity*** - Understanding, monitoring, and conserving biodiversity.

A fully-implemented GEOSS will be an enormous asset for achieving truly global sustainable growth and development to improve the lives of billions of people. Ultimately, all citizens require their governments to make credible and effective evidence-based policy decisions to enable sustainable growth and development. These decisions will govern how countries and individuals prepare for, and respond to, the challenges presented by environmental change and the subsequent impacts on societies and the natural environment. Only through access to coordinated, comprehensive, and sustained Earth observations can leaders make effective decisions and ensure protection of the environment and the sustainable growth of their countries, economies, and citizens.

By 2015, GEO will have built a system of systems that provides improved monitoring of the state of the Earth, increases our understanding of complex Earth processes, and makes predicting the behavior of Earth systems more accurate and reliable.

Section II: Report Card on GEOSS Early Achievements

The implementation of GEOSS is on target. It is guided by the 10-Year Implementation Plan that was approved by Ministers in 2005. The Plan includes 2-year, 6-year, and 10-year implementation targets. Since its adoption only two years ago, GEO Member Nations and Participating Organizations have taken substantive and significant steps towards achieving these targets. These early achievements of GEO are summarized in five broad categories:

- ✓ development of an efficient *organizational and governance structure*
- ✓ the *rapid mobilization* of the global Earth observation community
- ✓ the establishment of key *cross-cutting initiatives*
- ✓ the commencement of *capacity building* initiatives
- ✓ the initiation of specific *results-based activities* within each societal benefit area

Early achievements of GEO are presented in the ***Annex on Early Achievements***. This Annex details the specific achievements and contributions of Member Nations and Participating Organizations, describes progress towards the 2-year GEOSS implementation targets, and provides concrete examples of societal benefits that are already being achieved through the GEO process.

Organization and Governance

As a new international initiative with demanding requirements for the rapid implementation of GEOSS, an efficient and effective organizational and governance structure for GEO was

implemented. GEO now consists of a governing Plenary, an elected 12-member Executive Committee to maintain momentum between Plenary meetings, four technical Committees to inform and aid global coordination of key aspects of GEOSS implementation, ad-hoc working groups to tackle specific issues, and a Secretariat to coordinate and support implementation activities.

Over the last 2 years, the membership of GEO has increased from an initial 20 Member Nations to 72 Members including the European Union, and 46 Participating Organizations.

Community Mobilization

GEO provides a common vision to focus previously uncoordinated efforts, and has provided an effective forum for coordination across international boundaries. GEO has achieved an unprecedented mobilization and coordination of the world's Earth observation and science communities, institutions, technology platforms, and activities within the framework of GEOSS.

Because of GEO, many Earth observation activities and programs are converging around the objectives, requirements and standards of GEOSS, in recognition of the mutual benefits that can be achieved among global, regional, and national programs. The GEO community is benefiting from coordinated planning and improved inter-operability of systems, more efficient exchange of data and information, improved access to world-wide Earth observation data, and a better understanding of user needs. Many Organizations have redefined their objectives to more closely align with GEO goals, and some have allocated significant financial resources towards this goal.

GEO has catalyzed the creation of interdisciplinary 'Communities of Practice'. These communities efficiently bring together technical expertise and thematic user groups. The GEO Science and Technology Committee has engaged the scientific and technology communities, in part through the use of Communities of Practice. Further, the GEO User Interface Committee has engaged users through this mechanism to ensure that user needs are reflected in the GEOSS development process.

Cross-Cutting Initiatives, Technologies and Systems

GEOSS is the mechanism for coordination and collection of Earth observation data, their processing into useful information and prediction products, and their dissemination and use by experts, decision makers, and the general public. Initial activities have focused on improving data access and data sharing, advocating the protection of radio frequencies, advancing the development of interoperability between systems through global standards, developing mechanisms for the sharing and use of data and information products, and developing detailed specifications and demonstrations of the underlying architecture and user interface components of the System of Systems.

Capacity Building

Capacity building is the improvement of human, institutional and infrastructure capacity. It is an integral element in the successful development and implementation of GEOSS. Initial capacity building activities have focused on building on existing efforts of GEO Members and Participating Organizations to address gaps and to achieve improved access and better use of Earth observation data and products, especially in developing countries.

GEO has initiated a broad and ongoing dialogue between recipients, donors and facilitators of Earth observation capacity building with an emphasis on responding to local user needs. This includes a guiding principle that developing countries should participate in and own the various GEO initiatives that are being implemented. Capacity building places special emphasis on education and training, institution building, and creating sustainable infrastructure.

GEONETCast is an exemplary significant achievement. GEO has facilitated the development of a global satellite based dissemination system to broadcast real-time global environmental information to decision makers, researchers and individuals. GEO Members are now providing the infrastructure and receiving stations to an increasing number of developing countries to make data more widely available.

Key Initiatives for Societal Benefits

GEO has been a catalyst for the development and implementation of numerous Earth observation systems and programs in its first two years, ranging from relatively small local activities to large and complex global initiatives. Many societal and environmental issues are trans-boundary in nature. The application of GEO core values: convergence, harmonization, and cooperation, have been instrumental in the development of regional and global Earth Observation activities to provide better information on environmental status and change, and to better prepare for the societal risks that may result from these changes.

Building on existing systems and accelerating the development of others, early achievements in GEOSS include a program to monitor the health of forests, a global wildfire detection system, a system to observe and monitor the status of biodiversity, cooperative ventures to improve daily global weather forecasts, an application to provide access to solar radiation information for clean energy initiatives, and deployment of a world-wide network of ocean sensors for monitoring climate change.

To facilitate access to the shared GEOSS resources, emphasis has been on developing the underlying architecture of the 'System of Systems' to enable users to locate, access, and share key data, information and applications through a clearinghouse and Internet portal. Inter-operability arrangements, such as the GEOSS component and service registration, significantly serve the GEOSS community. GEO Members and Participating Organizations have developed regional results-based initiatives that have inspired partnership such as the provision of remotely sensed satellite data to monitor Africa's diverse environmental

challenges, implementation of an African Meningitis warning system, expanding a drought monitoring program in North America, improving water resource monitoring and management in Asia, and the developing a visualization, monitoring, and forecasting system for ecological change and severe events in Central and South America (SERVIR).

Europe is implementing a series of information services to address atmospheric, marine and terrestrial domains, as well as cross-cutting aspects pertaining to emergency response and climate change (GMES).

Because of these national, regional and local GEO initiatives, GEO Members now have unprecedented access to data and information for decision makers and front line users. These efforts significantly enable countries to monitor their environment and to make timely and informed decisions. Countries are also better able to comply with key multilateral environment agreements, including those related to biodiversity, desertification, and climate change, and to accurately report on their status and ability to meet target achievements.

Section III: GEO as an Integrating Process – Reducing Vulnerability from Environmental Change

The early achievements of GEO demonstrate that its Members and Participating Organizations are making significant early progress towards realizing the vision of GEOSS, that is, informed decision-making through coordinated, comprehensive and sustained Earth observation, monitoring and forecasting. Earth observations and predictive models provide the scientific underpinning for understanding the risks and vulnerabilities associated with environmental change and variability. With political will, a fully implemented GEOSS will further improve nations' ability to address many of the critical global challenges that we face: climate change, sustainable development, water security, healthy ecosystems and biodiversity, and the mitigation of natural and human-induced disasters. Informed decision and policy making in will contribute considerably to the health of the planet, and the health, safety, and economic well being of its citizens, particularly for those living in economically developing nations.

Climate Change and Sustainable Growth

The Earth's changing climate threatens the health and safety of human society. Effective prediction and response is a priority. The estimated 1.2 billion people who live within 100 meters of mean sea level are vulnerable to the impacts of sea level rise and extreme weather events. Whether in coastal areas or inland, both climate change and human development impact the health, productivity, and biodiversity of the natural and human environments, and limit to sustainable growth.

Observation and forecasting of climate change are essential to predicting impacts and developing adaptation measures to protect economic growth. GEOSS contributes to more

comprehensive and precise monitoring and predictions which will significantly improve the understanding of vulnerabilities to climate change at global, regional, and local scales.

Towards this end, GEO has integrated projects for coordinated global greenhouse gases observation, improved detection of climate change and its impacts, and better access to information products for policy makers, especially in coastal zones. The complexity of Earth system processes requires an integrated approach for observation, analysis, and modeling. The audience for this information is quite broad, encompassing coastal planners and engineers, emergency managers, insurers, and the public at large.

Water Security for Society and the Biosphere

Water is essential to virtually every human and natural system. Comprehensive knowledge and effective management of water is paramount to every nation's well-being and economy, as water availability can limit sustainable growth and development. GEOSS contributes to understanding the changing water cycle and its impacts on water supplies for human consumption, agriculture and industry, and maintenance of healthy ecosystems. It significantly improves the prediction of extreme weather events that result in drought or floods, and helps monitor the state of the oceans and the impacts of land-based sources of pollution.

GEO is demonstrating that operational monitoring systems provide effective tools to better understand the scope and potential impact of water-related events. Decision makers can use these tools to analyse and predict the impacts of water quality and availability, and to develop effective mitigation strategies. GEO efforts are targeted at developing regional and continental level systems for monitoring and managing crucial water resources.

Changing Landscapes, Ecosystem Health and Biodiversity

To achieve a sustainable future, the economically productive use of land and marine resources for such purposes as agriculture and forest resource production must be balanced with the protection of ecosystem health and the conservation of biodiversity. Natural systems provide a wide range of ecological services including plant varieties for new crops, industrial materials and medicines, protection from agricultural catastrophe, cleaning of water and the atmosphere, leisure and cultural value. A sound knowledge of current and evolving land cover, land use, the marine environment, and biodiversity provides the foundation for managing this balance of use and protection. There are increasing demands for land and marine resources for urban growth, agriculture, forestry, and fisheries, all of which are placing increasing pressure on natural systems and the critical habitats required to conserve biodiversity.

A role of GEO is to improve our knowledge of changes on the Earth's land, coastal regions, and oceans. The development of integrated and predictive models which link the physical changes to the Earth to the biological systems will help officials evaluate different scenarios, plan and take appropriate actions to balance the requirements of humans with those of nature.

Disaster Mitigation and Response

Disasters killed some 500,000 people and caused \$750 billion of damage over the decade 1990-2000. Wildland fires, volcanic eruptions, extreme weather, floods, and tsunamis, as well as human-induced events such as pollution, cause immense human suffering, loss of life and property, and impose a large economic burden on society. In our increasingly interconnected world, natural hazard events can trigger a cascade of further disasters such as outbreaks of disease and famine and long-term ecological damage.

Improving our ability to monitor, forecast, mitigate, and respond to natural and human-induced hazards is critical to reducing their impact. Building on the existing efforts of many Members and Participating Organizations, GEO is coordinating the Earth observations required for hazard detection and risk assessment. It is also advancing our capability to assess the risks and predict the occurrence of events (either rapidly- or slowly developing) so that mitigation and response actions may be better planned and executed. The efforts to enhance tsunami warning systems in the Indian Ocean, the establishment of a global wildfire warning system, improved severe weather forecasts and warnings, and cooperative satellite imaging for disaster response are examples of where the core values of GEO – convergence, harmonization, and cooperation – have already been successfully applied.

The Challenge

This report and the accompanying Annex describe how the efforts of Members and Participating Organizations of GEO have already led to substantial progress in the early implementation of GEOSS. To continue delivering benefits to multiple societal benefit areas, Members and Participating Organizations must renew their commitment to GEO. Further support will accelerate our ability to make critical decisions facing global leaders on the issues of Sustainable Growth and Development in an era of a significantly changing environment.

Earth observations provide essential data and information that are necessary for making informed decisions. The challenge is to sustain the interest and commitment of Governments and to marshal sufficient resources to implement the vision of a *coordinated, comprehensive, and sustained* system of systems that protects our planet and its people.

Section IV: Conclusions / Way Forward

As we move toward an expanding and harmonized GEOSS, it is essential that we chart a course of action that embodies the principles of sustainable growth and development. Coordinated, comprehensive and sustained approach to Earth observations, as recognized in the Washington Declaration at the first Earth Observation Summit in 2003, is now being realized.

In its evolution from concept to action and implementation, GEO continues to build the international framework to leverage national investments in Earth observations, prediction,

and information systems to realize concrete results across societal benefit areas. GEOSS contributes to improved science, improved modelling and prediction systems, improved information uses, and sustainability of primary observation, data and information systems. An ever-widening range of user communities are partnering with GEO, and new products and applications are being developed. All these activities have been successful due to the high visibility and high-level support of GEO.

The core values of GEO are essential to success. Convergence and harmonisation, effective participation and ownership by developing countries, focus on user needs and free and open access to data and information, are being enforced through GEO partnerships. To ultimately realise the System of Systems, significant effort is required to ensure that developing countries have the requisite capacity and data access to fully utilize and contribute to GEOSS with their own capacities, knowledge, institutions and infrastructure.

GEO has also identified a number of existing gaps and deficiencies in the global observation systems that must be addressed. These include significant gaps in the current geographic areas covered, and a lack of commitment to system continuity that will assure that critical observations continue in the future. Further, there remains considerable work to be done to fully incorporate GEOSS products into the decision-making processes of end-users, and on issues of data policy which restrict the access and use of some Earth observation data within GEOSS.

A Call to Action

Expressing the collective voice of the GEO community, a call to action on all Member nations is made, with emphasis on the following:

- **All GEO partners must work together to ensure timely, global and open access to share data and products.** To fully realize the benefits of GEOSS, it is imperative to have a framework that will support the GEO principle of free and open exchange of data. This implies the establishment of an end-to end, integrated and harmonized policy to govern the terms and conditions related to the access, sharing, collection, utilization, distribution and archiving of data and products. Data and products must be collected, analyzed and disseminated in order to support the public good across societal benefits areas, and radio frequency must be protected.
- **Observations need to be complemented, improved, and sustained.**
 - ***In situ* networks and airborne systems.** The updating, expansion, and maintenance of existing and new networks and systems are essential to address existing observation gaps and to ensure continuity of essential data for GEOSS.
 - **The sustained component of space-based observing systems needs to be expanded.** Space agencies should be encouraged to actively pursue the coordinated deployment of satellite constellations and the development of instruments aimed at fulfilling the observational needs of all Societal Benefit Areas in a sustained manner, while maintaining their efforts to improve observations through research and innovation.

- **Modeling and prediction capabilities need to be improved and expanded.** Mitigating socio-economic hazards requires major advances and commitments in the prediction of environmental change and the modeling of the Earth system. The GEO community must develop a new generation of models to ensure advancement in predicting high impact events.
- **The path to sustainability for GEO requires a renewed commitment for capacity building, especially in developing countries.** GEO itself is a capacity building exercise to bridge the gap between developing and developed nations, and to engage all countries as partners in the GEO process. To achieve this, the perspectives of developing countries need to be better understood and their needs incorporated into GEO plans and activities. Resources for implementation of the GEO Capacity Building Strategy, adopted at GEO-III in Bonn in 2006, are required. This strategy emphasises the need for educating communities, facilitating coordination, and providing and maintaining infrastructures that will help to ensure better decision-making for sustainable growth and development.

While membership in GEO is rapidly growing, increased user involvement should be encouraged. A number of initiatives focus on stakeholder participation and involve key policymakers, development institutions, and the financial sector in evidence-based decision-making. An improved capacity to enhance user engagement, with an emphasis on product and application development, is essential to shift from an observation model to one of prediction.

It is important to underscore the significant early achievements of GEO in building GEOSS, and that many mechanisms have been successfully implemented to meet the targets put forth in the Ten-Year Implementation Plan. Success is ultimately dependent on the continued support and cooperation of GEO Members and Participating Organizations.

As we continue to weave the fabric of GEOSS, to mobilize communities, change cultures, develop dialogue and facilitate integration, it is only fitting that we converge yet again in South Africa to address the challenge of managing the Earth through the commitment of sufficient and sustainable resources.

In closing, we quote the plea for action on human-induced problems of Mr. Thabo Mbeki, President of South Africa at WSSD in September 2002: *“It is informed by the sense that the means and the knowledge exist within human society successfully to address all these challenges. The question arises as to why as human beings we do not act, when we have the capacity to overcome problems that are not god-given, but are the creation of human society and human decisions and actions.”*